CS Softdesk’s Reduces Vibrations on Aging Compressor Station on Large Natural Gas Field in Poland

Bentley’s Integrated Design and Analysis Applications Optimize Engineering Workflows and Improve Productivity

A Need for a Connected Modeling Environment

Located in Stara Gora, Poland, Zuchlow natural gas field is the largest deposit of natural gas in the area, with available gas resources estimated at up to 24.5 billion cubic meters. The compressor station started production in 1979, extracting over 23 billion cubic meters of natural gas in over 35 years of operation. To increase gas input pressure to the existing pipeline and modernize the station to increase production, four large compressor units were installed in 1994, with two more aggregates subsequently added, and additional modifications, installations, and extensions performed over the years. The additional installations caused significant vibrations resulting in noise and accelerated component wear.

The internal research conducted on the nature of the dampening of vibrations induced by pressure pulsations revealed unique results that CS Softdesk implemented in this specific engineering case of a Polish natural gas field. It was the first project in Poland where a pressure pulsation system with pressure dampeners characterized by a distinct internal construction known as “multi-compartment bottles” was implemented as part of an industrial initiative. Using Bentley’s design and analysis applications to investigate a high-power compressor at one of Poland’s largest volume natural gas fields in the gas extraction and transport industry enabled CS Softdesk to design an innovative solution, optimizing time and costs. “Without this software, the implementation of this project would be much more expensive and prolonged,” stated Maciej Rydlewicz, CEO of research and development at CS Softdesk.

Interoperability Facilitates Iterative Design and Analysis

An important factor of this project was the coordination between the designers and CS Softdesk, as CS Softdesk performed its analysis and recommended solutions, and the different disciplines on the CS Softdesk project team. Using Bentley’s interoperable software provided a connected environment that enabled real-time, quality data exchange to streamline engineering workflows and enhance collaboration. Given the advanced and specialized design, calculations, and analysis required, including static, dynamic, and pressure pulsation analyses, CS Softdesk relied on AutoPLANT.

ROI

Bentley’s software facilitated real-time data exchange and streamlined workflows.

CS Softdesk automated repetitive tasks to accelerate design time and reduce overall costs.

CS Softdesk used half the resource hours to deliver the EUR 12 million project.

Fast Facts

• CS Softdesk identified the cause of the vibrations and eliminated the dynamics-related problems.
• CS Softdesk created the 3D model of the installation in AutoPLANT and imported it to AutoPIPE to perform iterative engineering analysis.
• CS Softdesk leveraged iModels to produce visual results for stakeholders and enable multi-discipline coordination.

Project Summary

Organization
CS Softdesk

Solution
Manufacturing

Location
Stara Gora, Poland

Project Objectives
• Reduce damaging vibrations from additional installations at a compressor station
• Design an innovative solution to eliminate dynamics-related problems and ensure cost-effective operation
• Preserve basic elements of the initial installation

Products Used
AutoPIPE®, AutoPLANT®, MicroStation®

A Need for a Connected Modeling Environment

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So Gazoprojekt, the field’s owner, undertook a comprehensive study of pressure pulsations and initial analyses into AutoPIPE to perform research and analysis. The team conducted a study of pressure pulsations and initial analyses of the dynamics of the compressor structure to identify the vibrations occurring in the operation process. After locating the sources and causes of vibration, the team decided to design and construct a new pressure pulsation system, requiring that pulsation dampening bottles, interconnecting ducts, and anti-pulsation tanks be mounted to the compressor. Considering the influence of gravity, pressure, temperature, and shock pulsations using AutoPIPE, CS Softdesk designed the new tanks with reactive filters to effectively reduce pressure pulsation level, and, as a result, reduce the structural vibrations and associated noise level by several hundred percent.

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AutoPIPE, and MicroStation to implement an iterative engineering process to determine the cause and location of the vibrations. CS Softdesk not only imported the AutoPLANT 3D model into AutoPIPE, but also exported it to the DGN iModel format to allow for near real-time coordination of the changes introduced because of the analyses conducted in AutoPIPE. The DGN model was further complemented by the addition of reference models in MicroStation for engineering coordination, and AutoPIPE model revisions for the performance of 3D visual clash detection analysis.

Bentley’s integrated software enabled the team to perform a harmonic analysis and assessment of the dynamic response of the system to complete the evaluation of the compressor plant piping system, which accelerated information mobility and minimized costs. The interoperability among Bentley applications facilitated a rapid and efficient exchange of relevant data and engineering information for an iterative analysis and design process that allowed for an optimal solution to simultaneously identify the acoustics problem.

Integrated Technology Delivers Benefits
Bentley’s analysis and design software provided an integrated engineering environment characterized by advanced features and capabilities that improved quality, accelerated workflows, and saved time, all of which directly affect costs. Bentley’s flexible, interoperable applications are aligned and worked well in the network and cloud environments used in CS Softdesk’s daily routine, and were capable of seamlessly exchanging large amounts of data and model files.

The reliability compared to competing software minimized rework associated with loss of, or incorrect data, while the automation of repetitive tasks accelerated design time and reduced costs.

Furthermore, the enhanced visual capabilities of Bentley applications simplified communication and improved understanding among project stakeholders. Specifically, the flexible visibility and layer transparency features in MicroStation were user friendly for quick and convenient coordination. Working with Bentley software preserved multi-discipline collaboration while simultaneously maintaining a unique and specialized approach. The integrated technology streamlined engineering processes through a connected data environment enabling the project to be completed without added resources and 50 percent faster compared to working with competing engineering analysis software.